

Memo

Date: Oct. 6, 2015

To: RSC, C. Gardner, and G. Mahler

From: D. Beavis 

Subject: *Booster Trench- Removal of Sandbags near the Booster Man (personal access) Gate*

I have requested that the sandbags be removed from the trench and above the trench near the Booster man gate. I have reviewed the beam fault studies for the extraction area. The only measurement I find related to the trench is in Booster FS no. 6. The dose was attributed to water pipes and read 0.75 mrad/hr while the man gate had a dose rate of 0.4 mrem/hr. The gate can have dose rates up to 360 mrem/hr for losses of 10^{14} protons per second. It is commented in the fault study logbook that these high dose rates would be prevented by the chipmunk on the berm.

Records have been checked and I have been unable to find any comments about placing sandbags in the trench. The sandbags are not documented on the shielding prints. I have used the labyrinth formula of Goebel and calculated the neutron attenuation in the labyrinth and the trench. The two should have similar attenuation for neutrons. The attenuation from the opening of the labyrinth in the Booster to the gate is $1.4 \cdot 10^{-5}$ ($2.7 \cdot 10^{-5}$) when using a height of 9 feet (11 feet). A simple formula estimates the dose rate to be $6.1 \cdot 10^5$ rem/hr at a meter from a possible loss in the transport of 10^{14} p/s at 1 GeV. The labyrinth opening is between 7.5 to 15 meters from potential loss locations in the beam line. The predicted dose rate at the gate ranges from 36 mrem/hr to 280 mrem/hr. The higher number is in reasonable agreement with the fault study. The building 914 is posted as a radiation area.

Any chipmunk providing protection for the gate will also provide protection for the trench if the dose is due to neutrons. If the dose at the exit of the trench is due to activity in the water pipes there may be modes of beam loss that can activate the magnet water but not cause the chipmunks to respond. However, the distribution of the sandbags is not an effective shield for the activated beam pipe. It is possible that the sandbags were placed in the trench as a precaution to reduce neutrons.

I have authorized that the sandbags above the trench and in the trench be removed. The sandbags that are now in the trench were too difficult to remove and shall remain in the trench indefinitely.

The committee should consider whether to have fault studies conducted at this area in the future and whether to move the 914 plug chipmunk inside the labyrinth across from the man gate. **(CK-12/1/15-Booster-Gardner&Beavis-956)**

Initial operations will begin with ions which do not have the fault potential that the Linac protons can produce.